Notice of Allowability	Application No.	Applicant(s)	
	10/526,477	AALTO ET AL.	
	Examiner	Art Unit	
	Hung Lam	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *03/04/2005*.

2. ☒ The allowed claim(s) is/are *1-20*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 03/04/2005
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *01/18/2008* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Benoit Castel, Reg. No. 35, 041 on the 18 of January, 2008.

The application has been amended as follows:

Listing of amended claims 1-20:

I. (Examiner amended) A method for controlling an optoelectronic component during a rise time period with control signals ~~(1, 2)~~,

- in which component there are at least two waveguides optically coupled to each other, the first waveguide (3) and the second waveguide (4), which form tracks to an optical signal,

- and in the beginning of which rise time period both control signals ~~(1, 2)~~ are on a common start level, namely on the first amplitude level (I), which is clearly higher than zero, so that the refractive indices of the waveguides (3, 4) are equal and the phase difference between them is zero,

- and at the end of which rise time period the first control signal ~~(1)~~ is on its target level, namely on the second amplitude level (II), which is clearly higher than the start level, and the second control signal ~~(2)~~ is correspondingly on its own target level, namely on the third amplitude level (III), which is clearly lower than the start level, so that the refractive indices of the waveguides (3, 4) are unequal and there is a predetermined phase difference between them,

- and the length of which rise time period is limited by the time required for generating and ~~stabilising~~ stabilizing a phase difference change between the waveguides,

- and in which method the rise time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner,

~~characterised~~ characterized in that for shortening the rise time period the second control signal ~~(2)~~ is first lowered to a fifth amplitude level (V), which is zero or substantially lower than the third amplitude level (III), and simultaneously the first control signal ~~(1)~~ is set to a fourth amplitude level (IV), which is clearly higher than the second amplitude level (II), and finally both control signals are set to their target level, and during which rise time period the control signals are adjusted so that in the last part of the rise time period the phase difference between the waveguides is already substantially settled to its target value, while the refractive indices of the individual waveguides are still clearly changing towards their target values~~, i.e. settling~~.

2. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that for obtaining a more step-wise phase difference change, the first control signal ~~(1)~~ is set from the fourth amplitude level (IV) to a seventh amplitude level (VII), which is lower than the second amplitude level (II), before it is set to the second amplitude level (II).

3. (Examiner amended) Method according to claim 2, ~~characterised~~ characterized in that the seventh amplitude level (VII) is chosen to be substantially equal with the fifth amplitude level (V).

4. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that for shortening the rise time period, the fourth amplitude level (IV) of the first control signal ~~(1)~~ is chosen so high that the phase difference clearly tends to rise above the predetermined target value of the phase difference, so that a so called overshoot of the refractive index is formed, and for

compensating the overshoot the amplitude of the second control signal ~~(2)~~ is raised to a sixth amplitude level (VI), which is higher than the fifth amplitude level (V).

5. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that for shortening the rise time period, the target level of the second control signal ~~(2)~~, namely the third amplitude level (III), is chosen to be higher than zero.

6. (Examiner amended) A method for controlling an optoelectronic component during a fall time period with control signals ~~(1, 2)~~,

- in which component there are at least two waveguides optically coupled to each other, the first waveguide (3) and the second waveguide (4), which form tracks to an optical signal,
- and at the beginning of which fall time period the first control signal ~~(1)~~ is on its start level, namely on the second amplitude level (II), which is clearly higher than the target level, and the second control signal ~~(2)~~ is correspondingly on its own start level, namely on the third amplitude level (III), which is clearly lower than the target level, so that the refractive indices of the waveguides (3, 4) are unequal and there is a predetermined phase difference between them,
- and in the end of which fall time period both control signals ~~(1, 2)~~ are on a common target level, namely on the first amplitude level (I), which is substantially higher than zero, so that the refractive indices of the waveguides (3, 4) are equal and the phase difference between them is zero,
- and the length of which fall time period is limited by the time required for generating and ~~stabilising~~ stabilizing a phase difference change between the waveguides,
- and in which method the fall time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner,

~~characterised~~ characterized in that for shortening the fall time period the first control signal ~~(1)~~ is first lowered to an eighth amplitude level (VIII), which is zero or substantially lower than the first

amplitude level (I), and simultaneously the second control signal ~~(2)~~ is set to a ninth amplitude level (IX), which is substantially higher than the first amplitude level (I), and finally both control signals are set to the first amplitude level (I), and during which fall time period the control signals are adjusted so that in the beginning of the rise time period the refractive index difference between the waveguides decreases fast to zero and during the last part of the fall time period it substantially remains at zero, so that the phase difference between the waveguides is already substantially settled to zero, while the refractive indices of the individual waveguides are still clearly changing towards their common target value~~, i.e. settling~~.

7. (Examiner amended) Method according to claim 6, ~~characterised~~ characterized in that for obtaining a more step-wise phase difference change, the second control signal ~~(1)~~ is set from the ninth amplitude level (IX) to the tenth amplitude level (X), which is lower than the first amplitude level (I), before it is set to the first amplitude level (I).

8. (Examiner amended) Method according to claim 7, ~~characterised~~ characterized in that the tenth amplitude level (X) is chosen to be substantially equal with the eighth amplitude level (VIII).

9. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that at least one of the following is chosen to be zero: third amplitude level (III), fifth amplitude level (V), seventh amplitude level (VII), eighth amplitude level (VIII), tenth amplitude level (X).

10. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the phase difference between the first and the second waveguide is modulated with two or several successive modulators (10, 11).

11. (Examiner amended) Method according to claim 10, ~~characterised~~ characterized in that the modulators (10, 11) are controlled to operate in turn.

12. (Examiner amended) Method according to claim 11, ~~characterised~~ characterized in that only some of the successively intended phase difference changes are implemented with control signals corresponding to one modulator (10) and other phase difference changes are implemented with the control signals of the following one or several modulators that are arranged successively with respect to the aforementioned modulator (11) so that the phase difference changes caused by them sum up, so that the next phase difference change can be implemented with the next modulator as soon as the previous phase difference change is implemented, although the refractive indices of the waveguides of the modulator that implemented it have not yet settled to their target levels.

13. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that at least two successive modulators (10, 11) are mutually different so that the first modulator (10) is significantly faster and consumes more power than the second modulator (11), so that the first modulator is used for implementing fast ~~and/or~~ or successive phase difference changes and the second modulator is used for implementing slow ~~and/or~~ or single phase difference changes and for implementing long static operating states, so that the average power consumption is significantly smaller than by using only the first modulator and the maximum modulation speed is significantly higher than by using only the second modulator.

14. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that during their rise ~~and/or~~ or fall time periods the control signals are optimized so that they depend, not only on the start and target state of the phase difference, but also on at least one phase difference change that precedes the start state ~~and/or~~ or succeeds the target state of the phase difference, so that the optimization takes into account such potential settling time that immediately precedes ~~and/or~~ or succeeds the given phase difference change, and during which settling time the phase difference has already reached its target value, but the refractive indices of the waveguides have not yet settled.

15. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the predetermined target value of the phase difference is set to be ~~approx.~~ about 180°.

16. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the waveguides (3, 4) are arranged as waveguides on planar substrates.

17. (Examiner amended) Method according to claim 16, ~~characterised~~ characterized in that the waveguides (3, 4) are chosen among:

-SOI (silicon-on-insulator) waveguides,

- glass waveguides,

- polymer waveguides,

- compound semiconductor waveguides.

18. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the optoelectronic component is chosen to be an optical switch~~, like an interferometric optical switch~~.

19. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the optoelectronic component is chosen to be a component which includes one or several Mach-Zehnder interferometers, which forms an optical switch or a filter.

20. (Examiner amended) Method according to claim 1, ~~characterised~~ characterized in that the optical switch is chosen to be a thermo-optic switch where the modulators (10, 11) are heating elements (5, 6, 7, 8) that heat the waveguides (3, 4) and electrical control signals ~~(1, 2)~~ consist of control voltage/current pulses directed to the heating elements, so that a control signal amplitude level corresponds to the heating power induced in the heating element by a control voltage/current pulse.

Status of the Application

Claims 1-20 are allowed.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:

The prior art does not show or fairly suggest the claimed invention of a method for controlling an optoelectronic component having the claimed structure and claimed limitations, wherein a rejection under 35 USC 102 or 103 would be improper.

Lackritz et al. (US. Pat. 6236774) and **Brinkman et al.** (US. Pub. 2002/0037129) which is directly related to the applicant cited prior art (WO 01/16648), are the most relevant prior arts of record.

Lackritz et al. disclose an optoelectronic and photonic devices having an optoelectronic component with controlling signals during a rise time period, wherein the component comprise at least two branched waveguides (46, 48) optically coupled to each other, and the branched waveguides comprises heaters electrode (50, 52) with controlling/modulating signals (54, 56). At the beginning of the rise time period (beginning of modulation process), heaters in both waveguide are on a start level, so the refractive index of both waveguides are the same or at least greater than zero, therefore, the phase different between them is zero (col. 20 lines 53-60, Fig. 11). At the end of the rise time period (beginning of modulation process), each of waveguide is on its own target level (refractive index or amplitude level) difference from each other, which is also differed from start level, therefore, the phase difference or phase shift occurs between them (col. 20 lines 61-67, col. 21 lines 15-18, and Fig. 11).

Similarly, **Brinkman et al.** also teaches thermo-optic switch having fast rise time that comprising a plurality of thermo-optic switch in an optical path for fast individual switch rise times. The switching operation divided into regimes such as regime I (steady-state regime), regime II (overdrive regime such that the response time of device is approximately equal to the drive pulse width), and regime III is referring to a near-impulse response regime in which the drive pulse is reduced to a value that is less than rise time of steady state (regime I) and overdrive pulse (regime II). By comparing and combining between these regimes in order to reduce the switching rise time and maximizing the device lifetime ("Abstract" and "Summary of the invention").

Regarding **claims 1 and 6, Lackritz et al.** and **Brinkman et al.** in combination, however, still fail to teach that "the rise time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner, characterized in that for shortening the rise time period the second control signal (2) is first lowered to a fifth amplitude level (V), which is zero or substantially lower than the third amplitude level (III), and simultaneously the first control signal (1) is set to a fourth amplitude level (IV), which is clearly higher than the second amplitude level (II), and finally both control signals are set to their target level..." and "the fall time period is shortened by adjusting the control signals between their start and target levels in an appropriate manner, ... and during the last part of the fall time period it substantially remains at zero, so that the phase difference between the waveguides is already substantially settled to zero, while the refractive indices of the individual waveguides are still clearly changing towards their common target value". Therefore, by controlling the shortening the rise/fall time period process then the phase difference between the waveguides can be adjusted to a target value.

Therefore, claims 1 and 6 are allowable as distinguishes over the prior art of record because of the reason stated above. It is this examiner's position that prior art taken alone, fails to disclose or render obvious in combination with the rest of the limitations of claims 1 and 6.

Claims 2-5 and 7-20 are allowable as dependent claims of claims 1 and 6.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Cited Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Takabayashi et al. (US. Pat. 6,882,760).

Nishimoto et al. (US. Pat. 5,359,449).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung Lam whose telephone number is 571-272-9790. The examiner can normally be reached on M - F 07:30 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hung Lam,
Assistant Examiner
Tel.: 571-272-9790

Frank G. Font
Supervisory Patent Examiner
Technology Center 2800